CHAPTER

CHEMICAL REACTIVITY

MULTIPLE CHOICE QUESTIONS

1. **Non-metals are essential**
   (a) for the maintenance (b) for the existence
   (c) for the safety of life (d) all of these
2. **It has the highest percentage in earth's crust and oceans.**
   (a) calcium (b) carbon (c) oxygen (d) nitrogen
3. **The electronegative and non-metallic character from top to bottom**
   (a) increases (b) decreases (c) remain same (d) stable
4. **Chlorine only reacts with methane in**
   (a) darkness (b) sunlight (c) yellow light (d) screened light
5. **Chlorine has colour:**
   (a) pale yellow (b) greenish yellow (c) reddish brown (d) purple black
6. **These are highly oxidizing agents**
   (a) alkali metals (b) alkaline earth metals
   (c) transition metals (d) halogens
7. **The highest electronegative element in periodic table is**
   (a) fluorine (b) chlorine (c) bromine (d) iodine
8. **The electronic configuration of halogens is**
   (a) $ns^2\ np^5$ (b) $ns^2\ np^3$ (c) $ns^3\ np^5$ (d) $ns^2\ np^2$
9. **Non-metals are electronegative in nature and form oxides.**
   (a) acidic (b) basic (c) neutral (d) suboxide
10. **It is used to make jewelry items because of its unique characteristics like colour beauty, strength, flexibility and resistance to tarnish.**
    (a) gold (b) platinum (c) silver (d) copper
11. **White gold is an alloy of**
    (a) gold + palladium + zinc (b) palladium + silver + nickel
    (c) gold + silver + copper (d) palladium + nickel + zinc
12. **The alkaline earth metals are smaller in size and have more**
    (a) ionization energy (b) electron affinity (c) nuclear change (d) electropositive
13. **All alkali metals have the largest size and the lowest in their respective periods.**
    (a) electro negativity (b) ionization energy (c) electron affinity (d) electropositivity

14. **Metals have the tendency to lose their valence electron. This property of a metal is termed as**
(a) electro negativity (b) electropositivity (c) electron affinity (d) ionization power

15. **Copper, mercury, silver and gold are the examples of metals**
(a) very reactive (b) moderately (c) least reactive (d) none of these

16. **Cation in formed, when an element – electron to its outermost shell**
(a) loses (b) gains (c) donates (d) shares

17. **Metals which are easily oxidized are said**
(a) negative metals (b) state metals (c) reactive metals (d) non-reactive metals

18. **A metal in a compound always exists in which oxidation sate**
(a) negative (b) positive (c) neutral (d) zero

19. **Ionization energy of sodium is less than**
(a) aluminum (b) magnesium (c) copper (d) all of these

20. **All metals are solids except**
(a) sodium (b) magnesium (c) mercury (d) gold

ANSWER KEY

1	d	4	b	7	a	10	b	13	a	16	a	19	d
2	c	5	b	8	c	11	d	14	b	17	c	20	c
3	b	6	d	9	a	12	b	15	c	18	b	KIPS	

SHORT QUESTIONS

8.1 METALS

Q.1 What type of elements are metals?

Ans. Metals are the elements which are electropositive and form cations by losing electrons.
Example: Sodium, Potassium, Calcium, Magnesium and Aluminum etc.

Q.2 Name a metal which exists in liquid form?

Ans. All metals exist in solid state, only mercury (Hg) is the metal which exist in liquid state.

Q.3 What is the nature of a metal oxide?

Ans. When metals react with oxygen. They form oxides which are basic in nature because these oxides form strong alkalies in water.
Example: Na_2O, CaO, K_2O, MgO.

Q.4 Which group of metal is highly reactive?

Ans. Potassium, sodium, calcium, magnesium and aluminum are the highly reactive group of metals, because these are highly electropositive in nature. These are also known as alkali metals and alkaline earth metals.

Q.5 Why sodium metal is more reactive than magnesium metal?

Ans. Sodium metal is more reactive than magnesium metal because electropositivity of metals decreases along the period from left to right in periodic table. Elements in the start of the period are more metallic or electropositive. Across the period from left to right size of atoms decreases due to increase of nuclear charge. That's why, sodium is more reactive than magnesium.

Q.6 Name a metal which can be cut with knife?

Ans. Sodium is that metal which can be cut with knife, because it is soft.

Q.7 Name the best ductile and malleable metal?

Ans. The most / best ductile and malleable metal is gold.

Q.8 Name the metal which is the poorest conductor of heat?

Ans. The least / poorest conductor of heat is lead (Pb).

Q.9 What do you mean by malleable and ductile?

Ans. **Malleable:** Malleability is the property of metals. Malleable means a metal can be hammered and convert into sheets.
Ductile: Metals are also ductile because they can be drawn into wires.

Q.10 Why alkali metals are more reactive than alkaline earth metals?

Ans. Alkali metals are more reactive than alkaline earth metals because alkali metals have the largest size and the lowest ionization energy in their respective periods therefore alkali metals have highest metallic character, so these are more reactive than alkaline earth metals.

Q.11 What do you mean by metallic character?

Ans. **Metallic Character:**
Metals have the tendency to lose their valency electrons. This property of a metal is termed as metallic character or electropositivity.
Example: Metalic increases from top to bottom and decreases from left to right as sodium is less electropositive then potassium.

Q.12 Why metallic character decreases along a period and increases in a group 1?

Ans. **(a) Along a Period:**
Metalic character across the period from left to right decreases.

Reason:

(i) From left to right size of atoms decreases.

(ii) From left to right nuclear charge increases.

(b) In a Group:

Metallic character from top to bottom in a group increases.

Reason:

(i) Down the group size of atoms increases.

(ii) Top to bottom nuclear charge decreases

Q.13 Give the applications of silver?

Ans. Following are the important applications of silver.

(a) Alloys of copper with silver are widely used in making coins. Silver used in ornaments and in jewelry.

(b) Silver has also important application in mirror industry.

Q.14 Why silver is not used in pure form?

Ans. Silver is a very soft metal, that is why, it is rarely used as such in pure form.

Q.15 What do you mean by 24 carat gold?

Ans. Purity of gold is shown by carat that indicates the number of parts by weight of gold that is present in 24 parts of alloy. Twenty four carat gold is pure.

Q.16 Why gold is used to make jewelry?

Ans. Gold is a yellow soft metal and highly inert in atmosphere. Because of these properties gold is an ornamental metal and widely used in making jewelry.

Q.17 Why platinum is used for making jewelry?

Ans. Platinum is used to make jewelry items because of its unique characteristics like colour, beauty, strength, flexibility and resistance to tarnish. It provides a secure setting for diamonds and other gemstones, enhancing their brilliance.

Q.18 Why the second ionization energy of Mg is higher than its first ionization energy?

Ans. Second ionization of energy if magnesium is very high. It becomes very difficult to remove second electron from the Mg+ ions as nuclear charge attracts the remaining electrons strongly. As a result of this attraction size of the ion decreases and energy required to loss second electron is also high.

Q.19 What is difference between steel and stainless steel?

Ans.

Steel	Stainless Steel
Steel is a alloy of iron, manganese, cobalt, chromium and 4 percent carbon.	The best example of alloying is stainless steel. Which is good combination of iron, chromium and nickel.

Q.20 How platinum is used as a catalyst in automobiles and what are the advantages of this use?

Ans. Platinum alloyed with palladium and rhodium are used as catalyst in automobiles as catalyst converter.

8.2 NON METALS

Q.1 Why valency of chlorine is 1?

Ans. The valency of chlorine is 1 and its charge is negative, because chlorine belongs to the 17th group of periodic table. Its electronic configuration is

$Cl_{17} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^5$

The outermost (valence shell) of chlorine deficient by one electron. So, it accept one electron from any metal.

Q.2 Which factor controls the non-metallic character of the elements?

Ans. The non-metallic character of elements is controlled by electron affinity and Electronegativity.

Q.3 Why fluorine is more non-metallic than chlorine?

Ans. Small size elements having high nuclear charge, more electronegative in nature and have high electron affinity. Fluorine is the first member of group. Non- Metallic character decrease down the group. That is why, fluorine is more electronegative and non-metallic character in nature as compared to chlorine.

Q.4 Iodine exists in solid state, can it be beaten with hammer to form sheets?

Ans. No, only solid things or metals have the characteristics to be beaten with hammer to form sheet. Because iodine is covalent solid and have a weak inter molecular forces cannot be hammered to form sheets.

Q.5 Can liquids and gases be brittle?

Ans. No, only solid not metals and metals can brittle (easily break)

Q.6 Why the oxygen is called non-metal?

Ans. Non-metals form negative ions (anions) by gaining electrons oxygen atom can accept 2 electrons, therefore its valency is 2. $O + 2e^- \longrightarrow O^{-2}$

Q.7 Name two non-metals which are both brittLe and non-ductile

Ans. Graphite and silicon are the examples of non-metals which are brittle and non-ductile in nature.

Q.8 Name the most abundant non-metal in the earth's crust

Ans. Oxygen has the highest percentage in earth's 47% and in oceans 86% but 2nd highest in percentage of oxygen in atmosphere 21%.

Q.9 Give the non-metallic trend in halogens

Ans. The non-metallic trend in halogens decreases from top to bottom. As it depends upon Electronegativity. Fluorine has highest Electronegativity and more non-metallic in character than other members of halogens.

Q.10 Why do the non-metals accept electrons readily?

Ans. Non-metals accept electrons readily because they are usually electron deficient in nature. So they form an anion by gaining electrons.

Q.11 Why non-metals do not react with dilute acids while metals do react?

Ans. Non-metals do not react with dilute acids because non-metals are itself electron acceptors while metals react readily.

Q.12 How can we distinguish. a metal from a non-metal by simple physical methods?

Ans.

Metals	Non-metals
On heating metals usually become soft and flexible.	Non-metals are usually non-flexible even on heating.
They are difficult to cut.	These are easily cut or break.

Q.13 How we can distinguish a substance is metal or non-metals with the help of an acid?

Ans.

Metal	Non metal
Metals react with acid easily $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$ $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$	Non-metals rarely or usually not reactive towards the acids.

Q.14 Why is HF a weak acid?

Ans. HF (Hydrogen Fluorine) is a weak acid, because in HF compound, there are strong intermolecular bonding. So, it does not readily ionize in water and release H in water. The strong acid is that which readily ionized in water but HF does not easily ionized in water.

LONG QUESTIONS

Introduction

The different kinds of materials around us exist in variety of forms. Things like aeroplanes, trains, building frames, automobiles or even different machines and tools, are due to different properties of various metals. The non-metals exist as gases, liquids and soft or hard solids. They occupy upper right positions in the Periodic Table. Carbon, nitrogen, phosphorus, oxygen, sulphur, most of the halogens and the noble gases are non-metals. They show a variety of chemical reactivities. They form different ionic and covalent compounds, many of which are solids or gases.

8.1 METALS

Definition

Metals are the elements (except hydrogen) which are electropositive and form cations by losing electrons.

CATEGORIES

Metals can be categorized.

(a) Very reactive: potassium, sodium, calcium, magnesium and aluminum.
(b) Moderately reactive: zinc, iron, tin and lead.
(c) Least reactive or noble: copper, mercury, silver and gold.

MODERN PERIODIC TABLE

Q.No.1 What are the physical and chemical characteristics of metal?

Physical characteristics

(i) Almost all metals are solids (except mercury)
(ii) They have high melting and boiling points.
(iii) They possess metallic luster and can be polished.
(iv) They are malleable (can be hammered into sheets), ductile (can be drawn into wires) and give off a tone when hit.
(v) They are good conductor of heat and electricity.
(vi) They have high density.
(vii) They are hard (except sodium and potassium)

Chemical properties:

(i) They easily lose electrons and form positive ions.
(ii) They readily react with oxygen to form basic oxides.
(iii) They usually form ionic compounds with non-metals.
(iv) They have metallic bonding.

Modern Periodic Table

Fig. 8.1 Some common metals and non-metals.

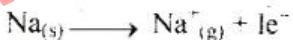
DO YOU KNOW

- The most abundant metal is aluminum
- The most precious metal is platinum
- The most useable metal is iron
- The most reactive metal is cesium
- The most valuable metal is uranium
- The lightest metal is lithium (d = 0.53 g cm^{-3})
- The heaviest metal is osmium (d = 22.5 g cm^{-3})
- The least conductor of heat is lead.
- The best conductor metals are silver and gold
- The most ductile and malleable metals are gold and silver

Q.No.2 **Define electropositive character. Write down the trends of electropositivity modern periodic table.**

8.1.1 ELECTROPOSITIVE CHARACTER

Definition

Metals have the tendency to lose their valance electrons. This property of a metal is termed electropositivity or metallic character.

Nature of metal

The more easily a metal loses its electrons is the more electropositive. The number of electrons lost by an atom of a metal is called its valency.

EXAMPLE

Sodium(Na_s)

sodium atom can lose 1 electron to form a positive ion

$$Na_{(s)} \longrightarrow Na^{+}_{(g)} + 1e^{-}$$

So the valency of sodium metal is1.

Zinc (Zn_s)

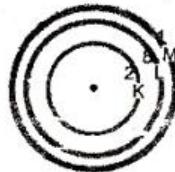
Zinc metal can lose 2 electrons from its valence shell. Therefore, its valency is 2. Zn(s)

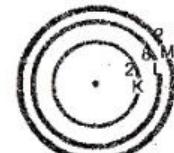
Trends of Electropositivity

(a) Trend in Group

Electropositive character increases down the group because size of atoms increases.

Example

Lithium metal is less electropositive than sodium which is in turn less electropositive than potassium.

(b) Trend in Period

Electropositive character decreases across the period from left to right in periodic table because size of atoms decrease due to increase of nuclear charge.

It means elements in the start of a period are more metallic. This character decreases as we move from left to right along the period.

Dependence of electropositive character

Electropositive character depends upon the ionization energy which in turn depends on size and nuclear charge of the atom. Small sized atoms with high nuclear charge have high ionization energy. In this way atoms having high ionization energy are less electropositive or metallic. That is the reason alkali metals have the largest size and the lowest ionization energy in their respective periods. Therefore, they have the highest metallic character.

Sodium Atom
$3s^1$ electron configuration
having atomic size 186 pm,
and ionization energy 496 $kJmol^{-1}$.

Magnesium Atom
$3s^2$ electron configuration
having atomic size 160pm,
and ionization energy 738 $kJmol^{-1}$.

EXAMPLE

Comparison of sodium and magnesium metals

sodium	magnesium
• Sodium Atom $3s^1$ electron configuration having atomic size 186 pm	• Magnesium Atom $3s^2$ electron configuration having atomic size 160pm
• Ionization energy of sodium is 496 $kjmol^{-1}$.	• Ionization energy of magnesium 1450 $kjmol^{-1}$.

Q.No.3 Why second ionization energy of alkaline earth metals is higher then first ionization energy?

Ionization energy of magnesium is high but the 2nd ionization energy of magnesium is very high. It becomes very difficult to remove second electron from the Mg^+ ion as nuclear charge attracts the remaining electrons strongly. As a result of this attraction size of the ion decreases.

Similarly all the elements of alkaline earth metals have high ionization energies as compared to alkali metals

Atomic Number, Electronic Configurations and Ionization Energies (kJ/mol) of Alkali and Alkaline Earth Metals.

Metal	Atomic Number	Electronic Configuration	IE	Metal	Atomic Number	Electronic Configuration	IE1	IE2
Li	3	[He] 2 s^1	520	Be	4	[He] $2s^2$	899	1787
Na	11	[Ne] 3 s^1	496	Mg	12	[Ne] $3s^2$	738	1450
K	19	[Ar] 4 s^1	419	Ca	20	[Ar] $4s^2$	590	1145
Rb	37	[Kr] 5 s^1	403	Sr	38	[Kr] $5s^2$	549	1064
Cs	55	[Xe] 6 s^1	376	Ba	56	[Xe] $6s^2$	503	965

Note: *Low ionization energies of alkali metals make them more reactive than alkaline earth metals.*

Q. No.4 How you can compare physical properties of alkali and alkaline earth metals?

COMPARISON OF PHYSICAL PROPERTIES OF ALKALI AND ALKALINE EARTH METALS

Property	Sodium	Magnesium	Calcium
Appearance	Silvery white having a metallic luster, very soft and can be cut with knife	Silvery white and hard	Silvery grey and fairly harder
Atomic size, ionic size (pm)	186, 102	160, 72	197,99
Relative density	0.98 g cm^{-3} Floats on water	1.74 g cm^{-3}	1.55 g cm^{-3}
Malleability	very malleable and ductile	Malleable and ductile	Malleable and ductile
Conductivity	Good conductor of heat and electricity	Good conductor of heat and electricity	Good conductor of heat and electricity
M.P	97°C	650°C	851°C
B.P	883°C	1090 °C	1484°C
Ionization energy	496 kJ/mol	738, 1450 kJ/mol	590,1145 kJ/mol
Flame in air	Golden yellow	Brilliant white	Brick red

Q.No.5 **Write down the properties of alkali and alkaline earth metal.**

ALKALI AND ALKALINE EARTH METAL

The elements in first two groups of the periodic table Group 1 (Li, Na, K, Rb, Cs, Fr) and Group 2 (Be, Mg, Ca, Sr, Ba) are called 'Alkali' and 'Alkaline-earth' metals respectively.

Alkali metals

- Alkali metals are extremely reactive elements because of their ns^1 valence shell electronic configuration.
- There is only one electron in their valence shell, it can be easily given out.
- They are always found in nature as cations with + I oxidation state.
- They readily form salts with non-metals.

Alkaline earth metals

- The alkaline earth metal atoms are smaller and have more nuclear charge.
- They have two electrons in their valence shells.
- They are also reactive but less than alkali metals

Q.No.6 **How you can compare chemical properties and reactivities of akali and alkaline earth metals?**

COMPARISON OF CHEMICAL PROPERTIES AND REACTIVITIES

Alkali Metals	Alkaline Earth Metals
1. Occurrence They are very reactive and always occur in combined form	They are fairly reactive and also occur in combined form
2. Electropositivity These are highly electropositive. They have ionization energy values ranging from 520 $kJmol^{-1}$ for Li to 376 $kJmol^{-1}$ for Cs.	They are less electropositive. They have ionization energy values ranging from 1757 $kJmol^{-1}$ for Be to 965 $kJmol^{-1}$ for Ba.
3. Reaction with water They react with water vigorously at room temperature to give strong alkaline solution and hydrogen gas $2Na+2H_2O \longrightarrow 2NaOH+H_2$	They react with water less vigorously and on heating they produce weak bases $Mg + H_2O \longrightarrow MgO + H_2$ $MgO + H_2O \longrightarrow Mg(OH)_2$
4. Reaction with Oxygen. They immediately tarnish III-A giving their oxides which form strong alkalies in water $4Na + O_2 \longrightarrow 2Na_2O$ $Na_20+H_2O \longrightarrow 2NaOH$	They are less reactive towards oxygen and oxides are formed on heating $2Mg+O_2 \longrightarrow 2MgO$
5. Reaction with Hydrogen They form ionic hydrides with H_2 at high temperature $2M+H_2 \longrightarrow 2MH$	They give hydrides under strong conditions of temperature and pressure $Ca + H_2 \longrightarrow CaH_2$
6. Reaction with Halogens They react violently with halogens at room temperature to give halides $2Na+Cl_2 \longrightarrow 2NaCl$	They react slowly with halogen to give their halides $Ca + Cl_2 \longrightarrow CaCl_2$
7. Reaction with Nitrogen They do not form nitrides directly	They form stable nitrides when heated with nitrogen $3Mg+N_2 \longrightarrow Mg_3N_2$
8. Reaction with Carbon They do not react with carbon directly	They give stable carbide on heating with carbon. $Ca+2C \longrightarrow CaC_2$

Q.No.7 Write down the properties of sodium, magnesium and calcium.

Uses of sodium

(i) Sodium-potassium alloy is used as a coolant in nuclear reactors.
(ii) It is used to produce yellow light in sodium vapour lamps.
(iii) It is used as a reducing agent in the extraction of metal like Ti.

Uses of magnesium

(i) Magnesium is used in flash lights and in fireworks.
(ii) It is used in the manufacture of light alloys.
(iii) Magnesium ribbon is used in Thermite process to ignite aluminium powder
(iv) Magnesium is used as anode for prevention of corrosion.

Uses of calcium

(i) It is used to remove sulphur from petroleum products.
(ii) It is used as reducing agent to produce Cr, U and Zn.

Q.No.8 Explain the chemical inertness of Noble metals.

Inertness of noble Metals

The elements in which d-orbital are in the process of filling, constitute a group of metals called transition metals or *d-group* elements.

- They exhibit a variety of oxidation states 'transition metals' of 4th, 5th and the 6th period of the periodic table.
- There are three series of transition elements; each series consisting of ten element
- Chemical behavior of the first transition series is similar to active metals except copper.
- Three transition metals belonging to group 11 are copper, silver and gold.
- Gold and silver are relatively inactive metals because they do not lose electrons easily.

Fig. 8.2 The Transition Elements in the Periodic Table.

Q.No.9 Write down the properties of silver, gold and platinum.

Silver

- It is white lustrous metal.
- It is an excellent conductor of heat and electricity.
- It is also highly ductile and malleable metal.
- Its polished surfaces are good reflectors of light.
- Formation of thin layer of oxide or sulphide on its surface makes it relatively unreactive.
- Under normal conditions of atmosphere, air does not affect silver.

- It tarnishes in presence of sulphur containing compounds like H_2S.
- Being very soft metal, it is rarely used as such.
- Alloys of silver with copper are widely used in making coins, silver-ware and ornaments.
- Compounds of silver are widely used in photographic. films and dental preparations.
- Silver also has important applications in mirror industry.

Gold

- It is a yellow soft metal.
- It is most malleable and ductile of all the metals.
- One gram of gold can be drawn into a wire of one and a half kilo meter long.
- Gold is very non-reactive or inert metal.
- It is not affected by atmosphere.
- It is even not affected by any single mineral acid or base.
- Because of its inertness in atmosphere, it is an ornamental metal as well as used in making coins.
- Gold is too soft to be used as such.
- It is always alloyed with copper, silver or some other metal.

Composition of pure gold

- Purity of gold is shown by carats that indicates the number of parts by weight of gold that is present in 24 parts of alloy. Twenty four carat gold is pure.
- 22 carats gold means that 22 parts pure gold is alloyed with 2 parts of either silver or copper for making ornaments and jewelry.

White gold

White gold is an alloy with Palladium nickel or zinc.

Platinum

- It is used to make jewelry items because of its unique characteristics like colour, beauty. strength, flexibility and resistance to tarnish.
- It provides a secure setting for diamonds and other gemstones, enhancing their brilliance.
- Platinum alloyed with palladium and rhodium are used as catalyst in auto- mobiles as catalytic convertor.
- They convert most of the gases being emitted by vehicles into less harmful carbon dioxide. nitrogen and water vapour.
- Platinum is used in the production of hard disk drive coatings and fibre optic cables.
- Platinum is used in the manufacturing of fibre glass reinforced plastic and glass for liquid crystal displays (LCD).

Q.No.10 What are non metals? Write down its trend in periodic table.

8.2 NON-METALS

Definition

Non-metals is a substance which form negative ions (anions) by gaining electrons.

Nature of non-metals

- Non-metals are electronegative in nature and form acidic oxides.
- The valency of some non-metals depend upon the number of electrons accepted by them.

Example

- Valency of chlorine atom is 1, as it accepts only 1 electron in its outermost shell.
- Oxygen atom can accept 2 electrons, therefore, its valency is 2.

Electron affinity and electronegativity

- The non-metallic character depends upon the electron affinity and electro negativity of the atom.
- Small size elements having high nuclear charge are electronegative in nature.
- They have high electron affinity. Therefore, they possess non-metallic nature.

Trend of non-metallic character

Non-metallic character decreases in a group downward and increase in a period from left to right up to halogens. That is the reason fluorine is the most non-metallic in character.

Example

- The non-metals are, therefore, elements in Group-14(Carbon).
- Group-15 (nitrogen and phosphorus), Group-16 (oxygen, sulphur and selenium) and in
- Group- 17 halogens (fluorine, chorine, bromine and iodine) of the periodic table.

Q.No.11 What are physical and chemical properties of non metals?

Physical properties of non-metals

- Physical properties of non-metals change gradually but uniquely in a group of non- metals.
- Non-metals usually exist in all three physical states of matter.
- The non- metals at the top of the group are usually gases while others are either liquids or solids.
- Solids non-metals are brittle (break easily).
- Non-metals are non-conductor of heat and electricity (except graphite).
- They are not shiny, they are dull except iodine (it is lustrous like metals).
- They are generally soft (except diamond).
- They have low melting and boiling points (except silicon, graphite and diamond).
- They have low densities.

Fig. 8.3 The Non-Metals in Periodic Table

Chemical properties of non-metals

- Their valence shells are deficient of electrons, therefore, they readily accept electrons to complete their valence shells and become stable.
- They form ionic compounds with metals and covalent compounds by reacting with other non-metals e.g. CO_2, NO_2, etc.
- Non-metals usually do not react with water.
- They do not react with dilute acids because non-metals are itself electron acceptors.

Trend of electro negativity

Electro negativity of first member of group 14, 15, 16 and 17 are higher than that of other members of the group decreasing their electro negativity.

Example

$$F > O > Cl > N > Br > S > C > I > P$$

Q.No.12 How you can compare the reactivity of the halogens?

Comparison of Reactivity of the Halogens

- Elements of Group-17 of the periodic table consist of fluorine, chlorine, bromine, iodine and astatine.
- They are collectively called halogens.
- Fluorine and chlorine exist as diatomic gases at room temperature.
- The intermolecular forces of attraction increase downward in the group due to the increase in the size of atom.
- Bromine exists as a liquid and iodine as solid.

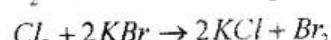
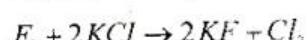
PHYSICAL PROPERTIES OF HALOGENS

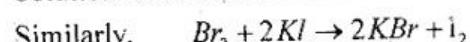
PHYSICAL CHARACTERISTICS OF HALOGENS

Element	Atomic No.	Electronic Configuration	Colour	Melting Point (K)	Boiling Point (K)	Electro negativities
F	9	$[He]2s^2p^5$	Pale Yellow	53	85	4.0
Cl	17	$[Ne]3s^3p^5$	Greenish	172	238	3.2
Br	35	$[Ar]4s^2 4p^5$	Reddish Brown	266	332	3.0
I	53	$[Kr]5s^25p^5$	Purple Black	387	457	2.7

- In general their valence shell electronic configuration ns^2np^5.
- Halogens have only one electron deficient in their valence shell; either they can readily accept an electron from a metal or they can share an electron with other non-metals.
- Halogens form ionic bonds with metals and covalent bond with non-metals.

Q.No.13 Give the chemical properties of Halogens.

REACTIONS OF HALOGENS

Oxidizing properties

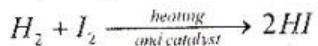
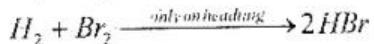
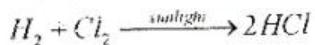
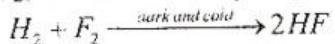
All halogens are oxidizing agent.

Fluorine is the strongest oxidizing element while iodine is the least i.e. Cl is mild oxidizing agent.

Fluorine will oxidize any of halide ion (X^{-1}) in solution and changes itself to F^- ion.

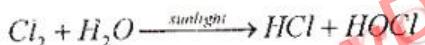
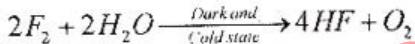
Chlorine will displace Br^- and I^- ion from their salt solutions and oxidize them to bromine and iodine.

$$F_2 + 2KCl \rightarrow 2KF + Cl_2$$

$$F_2 + 2Cl \rightarrow 2F^- + Cl_2$$

$$Cl_2 + 2KBr \rightarrow 2KCl + Br_2$$

Solution turns from colourless to reddish brown

Similarly, $Br_2 + 2KI \rightarrow 2KBr + I_2$

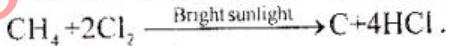
(i) Reaction with hydrogen

All halogens (X_2) combine with hydrogen to give hydrogen halides (HX).

$$H_2 + F_2 \xrightarrow{\text{dark and cold}} 2HF$$

$$H_2 + Cl_2 \xrightarrow{\text{sunlight}} 2HCl$$

$$H_2 + Br_2 \xrightarrow{\text{only on heating}} 2HBr$$

$$H_2 + I_2 \xrightarrow[\text{and catalyst}]{\text{heating}} 2HI$$

Trend of chemical reactivity of halogen

- The chemical affinity for H_2 decreases down the group from F_2 to Br_2
- Fluorine combines with hydrogen even in the dark and cold. state chlorine with hydrogen in th presence of sunlight.
- Bromine and iodine react with hydrogen only on heat.

(ii) Reaction with water

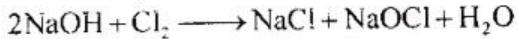
Flourine (F_2) decomposes water in cold state and in dark. Chlorine decomposes water in presence of sunlight. Bromine only react with water under special conditions. Iodine does not give this reaction.

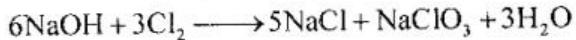
$$2F_2 + 2H_2O \xrightarrow[\text{Cold state}]{\text{Dark and}} 4HF + O_2$$

$$Cl_2 + H_2O \xrightarrow{\text{sunlight}} HCl + HOCl$$

$$Br_2 + H_2O \xrightarrow{\text{heat}} HBr + BOBr$$

$$I_2 + H_2O \rightarrow \text{No reaction}$$

Reaction with methane

Fluorine (F2) reacts violently with methane (CH_4) in dark chlorine Cl_2 does not react *with* methane in dark. However the presence of bright sunlight the reaction is violent.

$$CH_4 + 2Cl_2 \xrightarrow{\text{Bright sunlight}} C + 4HCl.$$

In presence of diffused sunlight the reaction of chlorine with methane is slow and gives series of compounds i.e. CH_3Cl, CH_2Cl_2, $CHCl_3$ and CCl_4.

(iii) Reaction with Sodium hydroxide

Chlorine reacts with cold ditute NaOH to give sodium hypochlorite

$$2NaOH + Cl_2 \longrightarrow NaCl + NaOCl + H_2O$$

Cl2 reacts with hot concentrated NaOH to give sodium chloride in

$$6NaOH + 3Cl_2 \longrightarrow 5NaCl + NaClO_3 + 3H_2O$$

Q.No.14 What are the significance of non metals in daily life?

Significance of Non-metals

Although non-metals are fewer than metals, yet they are highly significant. They are equally important for human beings, animals and plants. In fact, life would not have been possible without the presence of non-metals on earth.

As major components of earth's crust oceans and atmosphere

Major components of earth's crust, oceans and atmosphere are non-metals: oxygen has the highest percentage in earth' crust (47%) and oceans (86%) and it is second (21%) to nitrogen in atmosphere. It indicates the importance of oxygen in nature. To maintain the balance for the amount of non-metals in nature, different cycles like water cycle, nitrogen cycle etc have been established naturally.

As essential component of body

Non-metals are essential part of the body structure of all living things. Human body is made up of about 28 elements. But about 96% of the mass of the human body is made up of just 4 elements i.e. oxygen 65%, carbon 18%, hydrogen 10% and nitrogen 3%. Similarly plant bodies are made up of cellulose, which is composed of carbon, hydrogen and oxygen.

Respiration

Life owes to non-metals as without O_2 and CO_2 (essential gases for respiration of animals and plants respectively), life would not have been possible. In fact, these gases are essential for the existence of life.

Eatables

All-eatables like carbohydrates, proteins, fats, vitamins, water, milk etc which are necessary for the growth and development of body that are made up of non-metals; carbon, hydrogen and oxygen. Its shows non- metals playa vital role for the maintenance of life.

Importance of water

The essential compound for the survival of life of both animals and plants is water, which is made up of non-metals. Water is not only the major part by mass of animals and plants bodies, but it is also essential to maintain the life. We can survive without water for days but not for a long period; its shortage may cause death.

Importance of Nitrogen

Non-metal nitrogen, which is 78% in atmosphere, is necessary for the safety of life on earth. It controls the fire and combustion processes, otherwise all the things around us could burn with a single flame.

Role of non metal

Non-metals are playing essential role for the communication in life. All fossil fuels which are major source of energy: coal, petroleum and gas are made up of carbon and hydrogen. Even the essential component of combustion of fossil fuels, oxygen is also a non-metal.

Non-metals as a fibre

Non-metals protect us in a way, the clothes we wear are made of cellulose (natural fiber) or polymer (synthetic fiber).

Daily life use

In addition to all of these, other items used in daily life such as wooden or plastic furniture. plastic sheets and bags, plastic pipes and utensils are made of non-metallic elements. Even all the pesticides, insecticides. Fungicides and germicides consist of non-metals a major constituent.

SHORT QUESTIONS

Q.1 Why reactivity of metals increases down the group?

Ans: Reactivity of metals increases down the group because down the group because down the group, size of atoms increases due to addition of shells. When the shells are added and the size of atoms increases the electropositive character metallic character increases due to which it becomes easier to lose its valence electrons.

Q.2 Why reactivity of metals increases down the group?

Ans: Physical properties of metals.

- Almost all metals are solids (except mercury).
- Metals have high melting and boiling points.
- Metals posses metallic luster.
- Malleable and ductile.
- Meals are good conductors of heat and electricity.
- Meals have high density.

Q.3 Why nitrogen forms compounds with alkaline earth metals directly?

A alkaline earth metals form stable nitrides when heated with nitrogen.

$$3Mg + N_2 \longrightarrow Mg_3N_2$$

Q.4 Why the second ionization energy of magnesium is higher than the first one?

Ans: The first ionization energy of magnesium is high but the second ionization energy of Mg is very high. Because it becomes very difficult to remove second electron from the Mg^+ ion as nuclear charge attracts the remaining electrons strongly.

Q.5 How oxygen reacts with group II A metals?

Ans: They are less reactive towards oxygen and oxides are formed on heating

$$2Mg + O_2 \longrightarrow 2Mg$$

Q.6 What is relationship between electro positivity and ionization energy

Ans: Electropositivity depends upon the ionization energy which in turn depends upon sizeand nuclear charge of the atom.

- Small sized atoms with high nuclear charge have high ionization energy.
- Atoms having high ionization energy are less electropositive or metallic.

Q.7 Why electro positivity decreases from left to right in a period?

Ans: Electropositivity decreases across the period from left to right. It means elements in the start of periodic are more metallic. This is because of two reasons,

- Size of atoms decreases.
- Nuclear charges increases.

Q.8 How electro positivity depends upon size and nuclear charge of an atom?

Ans: Electropositivity depends upon size and nuclear charge of an atom because when the size of atoms increases, Electropositivity increases as it becomes easier to lose electrons. It also depends upon nuclear charge. If nuclear charge increases the Electropositivity decreases because it becomes difficult to remove the electrons from outermost shell.

Q.9 Why ionization energies of alkaline earth metals are higher than alkali metals?

Ans: Alkaline earth metals have higher ionization energies than alkali metals because the electronic configuration of their valence shells is ns^2. Their atoms are smaller and have more nuclear charge. That is why, they are reactive but less alkali metals.

EXERCISE

MCQ'S

1. **Metals can form ions carrying charges:**
   (a) Uni-positive (b) Di-positive (c) Tri-positive (d) All of them
2. **Which one of the following metals burn with brick red flame when heated in air?**
   (a) Sodium (b) Magnesium (c) Iron (d) Calcium
3. **Sodium is extremely reactive metal, but it does not react with:**
   (a) Hydrogen (b) Nitrogen (c) Sulphur (d) Phosphorus
4. **Which one the following is the lightest and floats on water:**
   (a) Calcium (b) Magnesium (c) Lithium (d) Sodium
5. **Pure alkali metals can be cut simply by knife but iron cannot because of alkali metals have:**
   (a) Strong metallic bonding (b) Weak metallic bonding
   (c) Non-metallic bonding (d) Moderate metallic bonding
6. **Which of the following is less malleable?**
   (a) Sodium (b) Iron (c) Gold (d) Silver
7. **Metals lose their electrons easily because:**
   (a) They are electronegative (b) They have electron affinity
   (c) They are electropositive (d) Good conductors of heat
8. **Which one of the following is brittle?**
   (a) Sodium (b) Aluminium (c) Selenium (d) Magnesium
9. **Which one of the following non-metal is lustrous?**
   (a) Sulphur (b) Phosphorus (c) Iodine (d) Carbon
10. **Non-metalsare generally soft, but which one of the following is extremely hard?**
   (a) Graphite (b) Phosphorus (c) Iodine (d) Diamond
11. **Which one of the following will not react with dilute HCl?**
   (a) Sodium (b) Potassium (c) Calcium (d) Carbon

ANSWR KEY

1	d	3	b	5	b	7	c	9	c	11	d
2	d	4	d	6	b	8	c	10	d	KIPS	

LONG QUESTIONS

Q.1 Compare and contrast the properties of alkali and alkaline earth metals.

Ans: See the topic comparison between Alkali and Alkaline arithmetic

Q.2 Discuss the inert character of silver and gold.

Ans: See the topic characteristics of silver and gold.

Q.3 Why cations are smaller and anions are bigger in size than their respective neutral atoms.

Ans: See the topic electropositive character and electronegative character.

Q.4 Discuss why hardness and softness of a metal depends upon its metallic bonding.

Ans: See the topic characteristic of metal.

Q.5 Give the reaction of sodium with; H_20, O_2, Cl_2 and H_2

Ans: See the topic chemical properties of metal.

Q.6 What are physical properties of calcium metal? Give its uses.

Ans: See the topic physical properties and uses.

Q.7 Write down the chemical properties of the non-metals?

Ans: See the topic chemical properties of the non-metals.

Q.8 Compare the physical properties of metals and non-metals

Ans: See the topic comparison between metals and non metals.

Q.9 How you can compare the softness and hardness of metals?

Ans: See the topic characteristics of metal.

Q.10 Give the chemical properties of magnesium and its uses

Ans: See the topic chemical properties of magnesium.

Q.11 Write a comprehensive note on the electropositive character of metals?

Ans: See the topic electropositive character of metals.

Q.12 Compare the ionization energies of alkali and alkaline earth metals.

Ans: See the topic comparison between alkali metal and alkaline metal.

Q.10 Why silver and gold are least reactive?

Ans: Silver and gold are least reactive because these metals do not lose their electrons easily. They do not have the tendency to make cations and due to their soft nature. They can not be used as such.

Q.11 Can pure gold be used for making ornaments? If not why?

Ans: No, pure gold can not be used for making ornaments.

Reason: Because gold is too soft to be used as such. It is always alloyed with copper, silver or some other metal.

Q.12 Why copper is used for making electrical wires?

Ans: Copper is used for making of electrical wires because copper is a good conductor of electricity and it is also ductile in nature as it can be easily drawn out into wires.

Q.13 What is the trend of variation in densities of alkali metals?

Ans: Densities of alkali metals increases down the group in the periodic table.

Q.14 Which metal is used for metal work?

Ans: As the metal work, means fire work. The metals are used in fire work due to its characteristic flame colour when they ignite in air . "Na" give golden colour, "Ca" give red colour etc.

Q.15 Why magnesium is harder than sodium?

Ans: Magnesium is harder than sodium because in magnesium metallic bonding is stronger. While sodium is relatively soft metal due to weak metallic bonding in their atoms.

Q.16 Why calcium is more electropositive than to magnesium?

Ans: Calcium is more Electropositivity than magnesium because metallic character or electropositive character or electropositive character down the group increases due to loosely held and can be easily with drawn from their shells.

Q.17 Why ionization energy of Na is less than Mg?

Ans: Ionization energy of Na is less than Mg because Na requires less energy to lose its valence electron than magnesium. Ionization energy is that energy which is required to remove outermost electrons from the gaseous state of an element.

Q.18 Why the ionization energy of Na is more than K?

Ans: The ionization energy of sodium is more than K because down the group electropositive character increases and ionization energy decreases. As it become easier electrons down the group.

CHAPTER

CHEMICAL REACTIVITY

MULTIPLE CHOICE QUESTIONS

1. Non-metals are essential

(a) for the maintenance (b) for the existence
(c) for the safety of life (d) all of these

2. It has the highest percentage in earth's crust and oceans.

(a) calcium (b) carbon (c) oxygen (d) nitrogen

3. The electronegative and non-metallic character from top to bottom

(a) increases (b) decreases (c) remain same (d) stable

4. Chlorine only reacts with methane in

(a) darkness (b) sunlight (c) yellow light (d) screened light

5. Chlorine has colour:

(a) pale yellow (b) greenish yellow (c) reddish brown (d) purple black

6. These are highly oxidizing agents

(a) alkali metals (b) alkaline earth metals
(c) transition metals (d) halogens

7. The highest electronegative element in periodic table is

(a) fluorine (b) chlorine (c) bromine (d) iodine

8. The electronic configuration of halogens is

(a) $ns^2\ np^5$ (b) $ns^2\ np^3$ (c) $ns^3\ np^5$ (d) $ns^2\ np^2$

9. Non-metals are electronegative in nature and form oxides.

(a) acidic (b) basic (c) neutral (d) suboxide

10. It is used to make jewelry items because of its unique characteristics like colour beauty, strength, flexibility and resistance to tarnish.

(a) gold (b) platinum (c) silver (d) copper

11. White gold is an alloy of

(a) gold + palladium + zinc (b) palladium + silver + nickel
(c) gold + silver + copper (d) palladium + nickel + zinc

12. The alkaline earth metals are smaller in size and have more

(a) ionization energy (b) electron affinity (c) nuclear change (d) electropositive

13. All alkali metals have the largest size and the lowest in their respective periods.

(a) electro negativity (b) ionization energy (c) electron affinity (d) electropositivity

14. **Metals have the tendency to lose their valence electron. This property of a metal is termed as**

(a) electro negativity (b) electropositivity (c) electron affinity (d) ionization power

15. **Copper, mercury, silver and gold are the examples of metals**

(a) very reactive (b) moderately (c) least reactive (d) none of these

16. **Cation in formed, when an element – electron to its outermost shell**

(a) loses (b) gains (c) donates (d) shares

17. **Metals which are easily oxidized are said**

(a) negative metals (b) state metals (c) reactive metals (d) non-reactive metals

18. **A metal in a compound always exists in which oxidation sate**

(a) negative (b) positive (c) neutral (d) zero

19. **Ionization energy of sodium is less than**

(a) aluminum (b) magnesium (c) copper (d) all of these

20. **All metals are solids except**

(a) sodium (b) magnesium (c) mercury (d) gold

ANSWER KEY

1	d	4	b	7	a	10	b	13	a	16	a	19	d
2	c	5	b	8	c	11	d	14	b	17	c	20	c
3	b	6	d	9	a	12	b	15	c	18	b	KIPS	

SHORT QUESTIONS

8.1 METALS

Q.1 What type of elements are metals?

Ans. Metals are the elements which are electropositive and form cations by losing electrons.
Example: Sodium, Potassium, Calcium, Magnesium and Aluminum etc.

Q.2 Name a metal which exists in liquid form?

Ans. All metals exist in solid state, only mercury (Hg) is the metal which exist in liquid state.

Q.3 What is the nature of a metal oxide?

Ans. When metals react with oxygen. They form oxides which are basic in nature because these oxides form strong alkalies in water.
Example: Na_2O, CaO, K_2O, MgO.

Q.4 Which group of metal is highly reactive?

Ans. Potassium, sodium, calcium, magnesium and aluminum are the highly reactive group of metals, because these are highly electropositive in nature. These are also known as alkali metals and alkaline earth metals.

Q.5 Why sodium metal is more reactive than magnesium metal?

Ans. Sodium metal is more reactive than magnesium metal because electropositivity of metals decreases along the period from left to right in periodic table. Elements in the start of the period are more metallic or electropositive. Across the period from left to right size of atoms decreases due to increase of nuclear charge. That's why, sodium is more reactive than magnesium.

Q.6 Name a metal which can be cut with knife?

Ans. Sodium is that metal which can be cut with knife, because it is soft.

Q.7 Name the best ductile and malleable metal?

Ans. The most / best ductile and malleable metal is gold.

Q.8 Name the metal which is the poorest conductor of heat?

Ans. The least / poorest conductor of heat is lead (Pb).

Q.9 What do you mean by malleable and ductile?

Ans. **Malleable:** Malleability is the property of metals. Malleable means a metal can be hammered and convert into sheets.
Ductile: Metals are also ductile because they can be drawn into wires.

Q.10 Why alkali metals are more reactive than alkaline earth metals?

Ans. Alkali metals are more reactive than alkaline earth metals because alkali metals have the largest size and the lowest ionization energy in their respective periods therefore alkali metals have highest metallic character, so these are more reactive than alkaline earth metals.

Q.11 What do you mean by metallic character?

Ans. **Metallic Character:**
Metals have the tendency to lose their valency electrons. This property of a metal is termed as metallic character or electropositivity.
Example: Metalic increases from top to bottom and [illegible]reases from left to right as sodium is less electropositive then potassium.

Q.12 Why metallic character decreases along a period and [illegible]ses in a group 1?

Ans. **(a) Along a Period:**
Metallic character across the period from left to right decreases.

Reason:

(i) From left to right size of atoms decreases.

(ii) From left to right nuclear charge increases.

(b) In a Group:

Metallic character from top to bottom in a group increases.

Reason:

(i) Down the group size of atoms increases.

(ii) Top to bottom nuclear charge decreases

Q.13 Give the applications of silver?

Ans. Following are the important applications of silver.

(a) Alloys of copper with silver are widely used in making coins. Silver used in ornaments and in jewelry.

(b) Silver has also important application in mirror industry.

Q.14 Why silver is not used in pure form?

Ans. Silver is a very soft metal, that is why, it is rarely used as such in pure form.

Q.15 What do you mean by 24 carat gold?

Ans. Purity of gold is shown by carat that indicates the number of parts by weight of gold that is present in 24 parts of alloy. Twenty four carat gold is pure.

Q.16 Why gold is used to make jewelry?

Ans. Gold is a yellow soft metal and highly inert in atmosphere. Because of these properties gold is an ornamental metal and widely used in making jewelry.

Q.17 Why platinum is used for making jewelry?

Ans. Platinum is used to make jewelry items because of its unique characteristics like colour, beauty, strength, flexibility and resistance to tarnish. It provides a secure setting for diamonds and other gemstones, enhancing their brilliance.

Q.18 Why the second ionization energy of Mg is higher than its first ionization energy?

Ans. Second ionization of energy if magnesium is very high. It becomes very difficult to remove second electron from the Mg+ ions as nuclear charge attracts the remaining electrons strongly. As a result of this attraction size of the ion decreases and energy required to loss second electron is also high.

Q.19 What is difference between steel and stainless steel?

Ans.

Steel	Stainless Steel
Steel is a alloy of iron, manganese, cobalt, chromium and 4 percent carbon.	The best example of alloying is stainless steel. Which is good combination of iron, chromium and nickel.

Q.20 How platinum is used as a catalyst in automobiles and what are the advantages of this use?

Ans. Platinum alloyed with palladium and rhodium are used as catalyst in automobiles as catalyst converter.

8.2 NON METALS

Q.1 Why valency of chlorine is 1?

Ans. The valency of chlorine is 1 and its charge is negative, because chlorine belongs to the 17th group of periodic table. Its electronic configuration is

$Cl_{17} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^5$

The outermost (valence shell) of chlorine deficient by one electron. So, it accept one electron from any metal.

Q.2 Which factor controls the non-metallic character of the elements?

Ans. The non-metallic character of elements is controlled by electron affinity and Electronegativity.

Q.3 Why fluorine is more non-metallic than chlorine?

Ans. Small size elements having high nuclear charge, more electronegative in nature and have high electron affinity. Fluorine is the first member of group. Non- Metallic character decrease down the group. That is why, fluorine is more electronegative and non-metallic character in nature as compared to chlorine.

Q.4 Iodine exists in solid state, can it be beaten with hammer to form sheets?

Ans. No, only solid things or metals have the characteristics to be beaten with hammer to form sheet. Because iodine is covalent solid and have a weak inter molecular forces cannot be hammered to form sheets.

Q.5 Can liquids and gases be brittle?

Ans. No, only solid not metals and metals can brittle (easily break)

Q.6 Why the oxygen is called non-metal?

Ans. Non-metals form negative ions (anions) by gaining electrons oxygen atom can accept 2 electrons, therefore its valency is 2. $O + 2e^- \longrightarrow O^{-2}$

Q.7 Name two non-metals which are both brittLe and non-ductile

Ans. Graphite and silicon are the examples of non-metals which are brittle and non-ductile in nature.

Q.8 Name the most abundant non-metal in the earth's crust

Ans. Oxygen has the highest percentage in earth's 47% and in oceans 86% but 2nd highest in percentage of oxygen in atmosphere 21%.

Q.9 Give the non-metallic trend in halogens

Ans. The non-metallic trend in halogens decreases from top to bottom. As it depends upon Electronegativity. Fluorine has highest Electronegativity and more non-metallic in character than other members of halogens.

Q.10 Why do the non-metals accept electrons readily?

Ans. Non-metals accept electrons readily because they are usually electron deficient in nature. So they form an anion by gaining electrons.

Q.11 Why non-metals do not react with dilute acids while metals do react?

Ans. Non-metals do not react with dilute acids because non-metals are itself electron acceptors while metals react readily.

Q.12 How can we distinguish. a metal from a non-metal by simple physical methods?

Ans.

Metals	Non-metals
On heating metals usually become soft and flexible.	Non-metals are usually non-flexible even on heating.
They are difficult to cut.	These are easily cut or break.

Q.13 How we can distinguish a substance is metal or non-metals with the help of an acid?

Ans.

Metal	Non metal
Metals react with acid easily $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$ $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$	Non-metals rarely or usually not reactive towards the acids.

Q.14 Why is HF a weak acid?

Ans. HF (Hydrogen Fluorine) is a weak acid, because in HF compound, there are strong intermolecular bonding. So, it does not readily ionize in water and release H in water. The strong acid is that which readily ionized in water but HF does not easily ionized in water.

EXERCISE

MCQ'S

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ANSWR KEY

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$$3Mg + N_2 \longrightarrow Mg_3N_2$$

Q.4 Why the second ionization energy of magnesium is higher than the first one?

Ans: The first ionization energy of magnesium is high but the second ionization energy of Mg is very high. Because it becomes very difficult to remove second electron from the Mg^+ ion as nuclear charge attracts the remaining electrons strongly.

Q.5 How oxygen reacts with group II A metals?

Ans: They are less reactive towards oxygen and oxides are formed on heating

$$2Mg + O_2 \longrightarrow 2Mg$$

Q.6 What is relationship between electro positivity and ionization energy

Ans: Electropositivity depends upon the ionization energy which in turn depends upon sizeand nuclear charge of the atom.

- Small sized atoms with high nuclear charge have high ionization energy.
- Atoms having high ionization energy are less electropositive or metallic.

Q.7 Why electro positivity decreases from left to right in a period?

Ans: Electropositivity decreases across the period from left to right. It means elements in the start of periodic are more metallic. This is because of two reasons,

- Size of atoms decreases.
- Nuclear charges increases.

Q.8 How electro positivity depends upon size and nuclear charge of an atom?

Ans: Electropositivity depends upon size and nuclear charge of an atom because when the size of atoms increases, Electropositivity increases as it becomes easier to lose electrons. It also depends upon nuclear charge. If nuclear charge increases the Electropositivity decreases because it becomes difficult to remove the electrons from outermost shell.

Q.9 Why ionization energies of alkaline earth metals are higher than alkali metals?

Ans: Alkaline earth metals have higher ionization energies than alkali metals because the electronic configuration of their valence shells is ns^2. Their atoms are smaller and have more nuclear charge. That is why, they are reactive but less alkali metals.

Q.10 Why silver and gold are least reactive?

Ans: Silver and gold are least reactive because these metals do not lose their electrons easily. They do not have the tendency to make cations and due to their soft nature. They can not be used as such.

Q.11 Can pure gold be used for making ornaments? If not why?

Ans: No, pure gold can not be used for making ornaments.

Reason: Because gold is too soft to be used as such. It is always alloyed with copper, silver or some other metal.

Q.12 Why copper is used for making electrical wires?

Ans: Copper is used for making of electrical wires because copper is a good conductor of electricity and it is also ductile in nature as it can be easily drawn out into wires.

Q.13 What is the trend of variation in densities of alkali metals?

Ans: Densities of alkali metals increases down the group in the periodic table.

Q.14 Which metal is used for metal work?

Ans: As the metal work, means fire work. The metals are used in fire work due to its characteristic flame colour when they ignite in air . "Na" give golden colour, "Ca" give red colour etc.

Q.15 Why magnesium is harder than sodium?

Ans: Magnesium is harder than sodium because in magnesium metallic bonding is stronger. While sodium is relatively soft metal due to weak metallic bonding in their atoms.

Q.16 Why calcium is more electropositive than to magnesium?

Ans: Calcium is more Electropositivity than magnesium because metallic character or electropositive character or electropositive character down the group increases due to loosely held and can be easily with drawn from their shells.

Q.17 Why ionization energy of Na is less than Mg?

Ans: Ionization energy of Na is less than Mg because Na requires less energy to lose its valence electron than magnesium. Ionization energy is that energy which is required to remove outermost electrons from the gaseous state of an element.

Q.18 Why the ionization energy of Na is more than K?

Ans: The ionization energy of sodium is more than K because down the group electropositive character increases and ionization energy decreases. As it become easier electrons down the group.

LONG QUESTIONS

Q.1 Compare and contrast the properties of alkali and alkaline earth metals.

Ans: See the topic comparison between Alkali and Alkaline arithmetic

Q.2 Discuss the inert character of silver and gold.

Ans: See the topic characteristics of silver and gold.

Q.3 Why cations are smaller and anions are bigger in size than their respective neutral atoms.

Ans: See the topic electropositive character and electronegative character.

Q.4 Discuss why hardness and softness of a metal depends upon its metallic bonding.

Ans: See the topic characteristic of metal.

Q.5 Give the reaction of sodium with; H_20, O_2, Cl_2 and H_2

Ans: See the topic chemical properties of metal.

Q.6 What are physical properties of calcium metal? Give its uses.

Ans: See the topic physical properties and uses.

Q.7 Write down the chemical properties of the non-metals?

Ans: See the topic chemical properties of the non-metals.

Q.8 Compare the physical properties of metals and non-metals

Ans: See the topic comparison between metals and non metals.

Q.9 How you can compare the softness and hardness of metals?

Ans: See the topic characteristics of metal.

Q.10 Give the chemical properties of magnesium and its uses

Ans: See the topic chemical properties of magnesium.

Q.11 Write a comprehensive note on the electropositive character of metals?

Ans: See the topic electropositive character of metals.

Q.12 Compare the ionization energies of alkali and alkaline earth metals.

Ans: See the topic comparison between alkali metal and alkaline metal.